

1690 U.S. PAT.
05/26/00

NONPROVISIONAL PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400
Facsimile: (703) 836-2787

Attorney Docket No.: 106281

Date: May 26, 2000

BOX PATENT APPLICATION

NONPROVISIONAL APPLICATION TRANSMITTAL RULE §1.53(b)

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

Transmitted herewith for filing under 37 C.F.R. §1.53(b) is the nonprovisional patent application

For (Title): A SUBSYSTEM OF PRODUCING DYE BASE BODY USED FOR DYEING OF
SPECTACLE LENSES AND A SPECTACLE LENS DYEING SYSTEM INCLUDING THE
DYE BASE BODY PRODUCING SUBSYSTEM

By (Inventors): Kenichi KAMATA, Minoru INUDUKA, and Tetsuo YAMADA

- ☒ Formal drawings (Figs. 1-6; 5 sheets) are attached.
☒ A Declaration and Power of Attorney is filed herewith.
☒ An assignment of the invention to Nidek Co. Ltd. is filed herewith.
☒ An Information Disclosure Statement is filed herewith.
☐ A statement to establish small entity status under 37 C.F.R. §§1.9 and 1.27 is filed herewith.
☐ A Preliminary Amendment is filed herewith.
☐ Please amend the specification by inserting before the first line the sentence --This nonprovisional application claims the benefit of U.S. Provisional Application No. _____, filed _____.
☒ Priority of foreign application No. 11-150821 filed May 31, 1999 in Japan is claimed (35 U.S.C. §119).
☒ A certified copy of the above corresponding foreign application(s) is filed herewith.
☒ The filing fee is calculated below:

CLAIMS IN THE APPLICATION AFTER ENTRY OF ANY PRELIMINARY AMENDMENT NOTED ABOVE

FOR:	NO. FILED	NO. EXTRA
BASIC FEE		
TOTAL CLAIMS	16 - 20	= 0
INDEP CLAIMS	1 - 3	= 0
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIMS PRESENTED		

* If the difference is less than zero, enter "0".

SMALL ENTITY

RATE	FEE
	\$ 345
x 9 =	\$
x 39 =	\$
+130 =	\$
TOTAL	\$

OTHER THAN A SMALL ENTITY

RATE	FEE
	\$ 690
x 18 =	\$
x 78 =	\$
+260 =	\$
TOTAL	\$ 690

- ☒ Check No. 108878 in the amount of \$690 to cover the filing fee is attached. Except as otherwise noted herein, the Director is hereby authorized to charge any other fees that may be required to complete this filing, or to credit any overpayment, to Deposit Account No. 15-0461. Two duplicate copies of this sheet are attached.
☐ This application is entitled to small entity status. DO NOT charge large entity fees to our Deposit Account.

Respectfully submitted,


James A. Oloff
Registration No. 27,075

JAO:JSA/emb

Joel S. Armstrong
Registration No. 36,430

Date: May 26, 2000

Inventor Information

Inventor One Given Name:: Kenichi
Family Name:: KAMATA
Name Suffix::
City of Residence:: Otokuni-gun
State or Prov. of Residence::
Country of Residence:: Japan
Inventor Two Given Name:: Minoru
Family Name:: INDUKA
Name Suffix::
City of Residence:: Hazu-gun
State or Prov. of Residence::
Country of Residence:: Japan
Inventor Three Given Name::
Family Name::
Name Suffix::
City of Residence::
State or Prov. of Residence::
Country of Residence::
Inventor Four Given Name::
Family Name::
Name Suffix::
City of Residence::
State or Prov. of Residence::
Country of Residence::
Inventor Five Given Name ::
Family Name::
Name Suffix::
City of Residence::
State or Prov. of Residence::
Country of Residence::

Correspondence Information

Name Line One:: Oliff & Berridge PLC
Address Line One:: P.O. Box 19928
City:: Alexandria
State or Province:: VA
Postal or Zip Code:: 22320
Telephone:: (703) 836-6400
Fax:: (703) 836-2787
Electronic Mail:: commcenter@oliff.com

Application Information

Title Line One:: A SUBSYSTEM OF PRODUCING DYE BASE
Title Line Two:: BODY USED FOR DYEING OF SPECTACLE
Title Line Three:: LENSES AND A SPECTACLE LENS DYEING
Title Line Four:: SYSTEM INCLUDING THE DYE BASE BODY

Title Line Five:: PRODUCING SUBSYSTEM
Total Drawing Sheets:: 5
Docket Number:: 106281

Continuity Information

>This application is a::
Application One::
Filing Date::
Patent Number::
which is a::
>>Application Two::
Filing Date::
Patent Number::

Prior Foreign Applications

Foreign Application One:: 11-150821
Filing Date:: May 31, 1999
Country:: Japan
Priority Claimed:: Yes
Foreign Application Two::
Filing Date::
Country::
Priority Claimed::
Foreign Application Three::
Filing Date::
Country::
Priority Claimed::

A SUBSYSTEM OF PRODUCING DYE BASE BODY USED FOR DYEING
OF SPECTACLE LENSES AND A SPECTACLE LENS DYEING SYSTEM
INCLUDING THE DYE BASE BODY PRODUCING SUBSYSTEM

5 BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a subsystem of producing a dye base body used for dyeing of a spectacle lens in accordance with a color and a coloring pattern selected for dyeing (coloring) the spectacle lenses, and a spectacle lens dyeing system including the dye base body producing subsystem for dyeing spectacle lenses by use of the produced base body.

2. Description of Related Art

Heretofore, when customers select spectacle lenses (which are hereinafter simply referred to as "lenses") with color in optical shops, the customers would select a desired color (and a desired coloring pattern such as a gradation pattern and others) while looking article samples, color samples, catalogs, etc. which have been prepared beforehand. Lens manufactures and lens dyehouses would perform lens-dyeing by preparing dyeing solutions (dyes) to provide the same color as that of the sample selected by each customer.

The above case, however, causes the following problems to each of the side of persons who select lens color (i.e., customers) and the other side of persons who perform lens dyeing (i.e., lens manufactures or lens dyehouses).

The color selecting side (customer) is offered the samples and the like to select a desired color while looking them. That

is, he/she should make a choice among colors available in the optical shop. This usually permits the customer only a small latitude in selecting a desired color. On the other hand, the dyeing side should prepare many samples and dyeing solutions (dyes) of many colors corresponding to the samples in order to respond to various needs of customers, thus increasing cost.

Even if the choice of a slightly different color from that of the sample can be accepted, a conventional dip dyeing method and a conventional vapor phase dyeing method (see Japanese Patent Laid-open Publication No. 1-277814) are substantially unable to appropriately mix dyeing solutions or dyes so as to provide the selected color. Since there is no sample of such the desired color, the customer also occasionally feels the color of the actually dyed lens different from the color selected by himself.

Furthermore, until the spectacles are completely assembled with the dyed lenses fit in a spectacles frame (hereinafter referred to as "frame"), the customer can not confirm whether the finished spectacles with the dyed lenses is matched to the face of the customer.

For resolving the above problems, there has been proposed an apparatus capable of photographing the face of a customer by a camera to display a picture image of the photographed face on a display while superimposing a frame image stored in advance in the apparatus and selected by the customer on the face image and applying a selected color (and a selected coloring pattern) to a lens area of the selected frame image. An example of such the apparatus is disclosed in Japanese Patent Laid-open Publication No. 11-353353.

However, the above apparatus is designed simply for allowing a customer to confirm whether the selected frame and the selected lens color (and coloring pattern) are matched to the face of the customer. Thus, in order to actually dye lenses in the selected color by use of the conventional dip dyeing method and the vapor phase dyeing method, the apparatus has to store data on producible colors (i.e., colors of prepared dye solutions or dyes) for the dyeing and therefore the customer can only select one among the stored colors.

In the conventional dyeing methods, particularly, lenses are hard to dye in various coloring patterns such as a gradation pattern. Accordingly, when a customer selects a desired color while looking article samples or picture images displayed on the above apparatus, he/she can only select one from among the coloring patterns which are actually dyeable. After all, the conventional dyeing methods allow customers only a small latitude in selecting a desired coloring pattern.

SUMMARY OF THE INVENTION

The present invention has been made in view of the above circumstances and has an object to overcome the above problems and to provide a subsystem capable of producing a dye base body used for accurately and easily dyeing spectacle lenses so as to have a desired color and coloring pattern freely selected by a customer, and a spectacle lens dyeing system including the dye base body producing subsystem.

Additional objects and advantages of the invention will be set forth in part in the description which follows and in part

will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

5 To achieve the purpose of the invention, there is provided a subsystem for producing a dye base body used for dyeing of a spectacle lens, the subsystem including: a camera for photographing a face of a customer; color memory means for storing a plurality of color data; color selection means for selecting
10 a desired color data from among the plurality of color data stored in the color memory means; display control means for controlling a display to display an image of the face of the customer photographed by the camera and coloring a lens area of a displayed spectacle frame image in accordance with the selected color data;
15 printing means for printing by use of sublimatable dye contained therein; and print control means for controlling the printing means to print a predetermined shape with the dye on a printing base body in accordance with the selected color data to produce the dye base body.

20 According to the present invention, the customer can freely select a color and a coloring pattern of the spectacle lenses to be dyed while confirming the display which displays the photographed face image and the frame image including the lens area colored based on the selected color data. The printing means,
25 under control of the printing control means, can print the predetermined shape with the sublimatable dye on the printing base body based on the selected color data to produce the dye base body. Thus, the lens can be accurately and easily colored with the dye

applied on the dye base body in correspondence with the selected color and coloring pattern.

According to another aspect of the invention, there is provided a spectacle lens dyeing system including the above described dye base body producing subsystem for dyeing of the spectacle lens, the dyeing system including dyeing means for dyeing the spectacle lens by arranging the produced dye base body to face the spectacle lens to be dyed, heating the base body under vacuum, thereby sublimating coloring matter in the dye printed on the base body to deposit the sublimated dye onto the lens.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification illustrate an embodiment of the invention and, together with the description, serve to explain the objects, advantages and principles of the invention.

In the drawings,

Fig. 1 is a schematic structural view of a spectacle lens dyeing system in an embodiment according to the present invention;

Fig. 2 is an enlarged sectional view of a part of a support plate with a hole (left one) provided in a dyeing device used in the dyeing system in the embodiment;

Fig. 3 is an example of a screen of a display to select lens colors and coloring patterns;

Fig. 4 is an explanatory view of showing a method of obtaining locational data to produce a half (gradation) pattern as a lens coloring pattern;

Figs. 5A-5D are schematic views of dye base bodies produced

for a half (gradation) pattern; and

Fig. 6 is a graph showing the transmittance of lenses dyed using the dye base bodies shown in Figs. 5A-5D.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A detailed description of a preferred embodiment of a spectacle lens dyeing system including a dye base body producing subsystem embodying the present invention will now be given referring to the accompanying drawings.

10 Fig. 1 is a schematic structural view of the spectacle lens dyeing system in the present embodiment.

 Numeral 10 is a spectacle lens selection device installed in an optical shop 100. This device 10 is provided with a television camera 1, a computer 3, a color display 2. The image photographed by the camera 1 is transmitted to the computer 3 and stored as a still picture in an image memory of the computer 3. The computer 3 also includes a program for selecting a frame, a lens color, and a lens coloring pattern. A customer can thus select a desired frame, lens color, and lens-coloring pattern while looking the photographed picture image displayed on a screen of the display 2. Numeral 3a is a mouse connected to the computer 3. Numeral 3b is a keyboard connected to the computer 3. By use of the mouse 3a and the keyboard 3b, a command is input to the computer 3.

25 The computer 3 is on-line linked to a computer 50 installed in a lens manufacturer 200 through a communication line 150 such as a telephone line or the like. Each of the computers 3 and 50 has a function of transmitting and receiving data on orders and

others. In the lens manufacturer 200, installed are a printer 60 connected to the computer 50 and a dyeing device 40 for dyeing lenses 44. It should be noted that, if the lens manufacturer having received an order for a colored lens from the optical shop further sends an order for the dyeing of the lens to a lens dyehouse (dyer), the computer 50, the printer 60, and the dyeing device 40 are also installed in the dyehouse.

In the present embodiment, the spectacle lens selection device 10, the communication line 150, the computer 50, and the printer 60 configure the subsystem of producing a dye base body used for the dyeing of spectacle lenses. Those elements in addition to the dyeing device 40 also constitute the spectacle lens dyeing system.

The printer 60 is a general printer such as an ink-jet type printer, a plotter, etc., which are available on the market. The printer 60 prints a predetermined shape with a sublimatable dye which is a solvent for lens-dyeing onto a printing base body 61 (which is high-quality PPC white paper available on the market) to produce a dye base body 63.

Next, the structure of the dyeing device 40 is explained. The dyeing device 40 is provided, in its front upper portion, with an opening not shown through which the dye base body 63 and lenses 44 are inserted into the device 40 or removed therefrom.

Number 41 denotes a support shaft which is operable to move a support plate 42 for holding thereon the lenses 44 in a vertical direction, bringing the plate 42 close to the opening. The support plate 42 has two circular holes 42a disposed symmetrically with respect to the support shaft 41, i.e., at a right and left

sides thereof in Fig. 2. Fig. 2 shows an enlarged view of a left one of the holes 42a. The circular hole 42a is designed to have a larger diameter than that of the lens to be placed thereon.

Numeral 43 is a cylindrical lens-holder disposed so that the back surface of the lens 44 put on the holder 43 faces the holes 42a.

On the underside of the support plate 42, the dye base body 63 is attached so that the colored layer (made of printed sublimatable dye) 62 is positioned on the upper surface of the body 63 in correspondence with the hole 42a, thereby to allow the dye (coloring matter) of the colored layer 62 to sublimate toward the lens 44 through the hole 42a of the plate 42.

The material of the plastic lens 44 which is dyable with sublimatable dye is selected from polycarbonate resin (e.g., diethyleneglycol bis-allyl carbonate polymer (CR-39)), polyurethane resin, allyl resin (e.g., allyl diglycol carbonate and its copolymer, and diallyl phthalate and its copolymer), fumaric acid resin (e.g., benzyl fumarate copolymer), styrene resin, polymethyl acrylate resin, fibrid resin (e.g., cellulose propionate) and so on.

Numeral 45 is a heater for sublimating the dye printed on the dye base body 63. The setting of this heater 45 is adjustable to a desired temperature value. The material of the heater 45 in the present embodiment is aluminum which is high in thermal conductivity. By the passage of an electric current through a Nichrome wire not shown provided inside the heater 45, the surface temperature of the heater 45 is increased. This surface temperature is sensed by a temperature sensor 46 to detect whether or not the temperature reaches a preset value.

A rotary vacuum pump 47 is used to produce an almost vacuum in the dyeing device 40. Numeral 48 is a leak valve provided in the device 40. This valve 48 is opened after the dyeing operation to take air into the device 40 maintained under vacuum, thereby to return it to an atmospheric pressure.

Next, explanation is made on operations from selection of a lens color and a coloring pattern in an optical shop to dyeing of the lens in a lens manufacturer or a dyehouse. First, the selection of a frame, a lens color and a coloring pattern using the selection device 10 is described below.

When the power of the device 10, or the computer 3, is turned on, calling the selection program, a photograph/memory mode is automatically established. An operator in the optical shop requests a customer to put on a desired frame and takes a picture of the customer wearing the selected frame by the camera 1. The operator (or the customer himself) confirms the photographed picture image displayed on the screen of the display 2 and clicks the left button of the mouse 3a to store the photographed image as a still picture image in the image memory of the computer 3.

The customer may put on several desired frames alternately. Every time the customer puts on one, the operator similarly operates to take a picture of the customer's face to store it in the image memory.

Sequentially, the operator operates the mouse 3a to position a pointer 15 in a key (icon) 16 displayed on the screen and clicks the mouse button, thus switching the photograph/memory mode to a frame selection mode. At this time, the still picture images stored in the image memory are displayed on the screen of the

display 2, for example, on a two-split screen to permit the display of two picture images. Thus, the customer can decide a desired frame while visually confirming and comparing the displayed picture images. It is to be noted that the images of only frames may be stored in advance in the image memory of the computer 3. In this case, the customer is photographed by the camera 1 without wearing a frame so that the frame image stored in the memory is superimposed on the photographed face image, thereby to display the customer's face as if wearing the frame.

After decision of a desired frame by the customer, the operator positions the pointer 15 in a key (icon) 17 displayed on the screen (see Fig. 1) and clicks the key 17, thereby to switch the frame selection mode to a lens color selection mode of selecting a lens color and a coloring pattern. Fig. 3 shows an example of the screen in this mode. Numeral 21 is an image of the face of the customer. Numeral 22 is a frame image. In this mode, the computer 3 is made to recognize where the lens area within the frame image 22 is located. Specifically, the operator operates the mouse 3a to point the pointer 15 to a border between the frame and the lens on the screen and clicks the left mouse button on several points one by one along the border. Thus, a lens area 23 can be specified within the frame image 22.

In the lens area 23, the color and the coloring pattern which were selected in the last use of the device 10 first appear. The color also appears within a window 23a on the screen in order to obviously show the color tone of the selected color. To change the hue (tint) of the lens area 23 to a desired hue, the operator places the pointer 15 to the desired hue point in a bar 24a of

a hue item 24 and clicks the mouse button or drags and drops a cursor 24b to any point by operation of the clicks of the mouse 3a. To change the lightness (density) of the lens area 23, the operator places the pointer 15 to the desired lightness point in a bar 25a of a lightness item 25. In the present embodiment, the bar 25a is configured of several sections of lightness changed in a step-by-step manner. Alternatively, the bar 25a may be configured of a single section of lightness continuously changed.

The color produced by combination of the selected hue and lightness in the hue item 24 and the lightness item 25 is indicated as a CIE color specification value 26, for example, in the form of numeric data such as $L^*=00$, $a^*=00$, $b^*=00$ as shown in Fig. 3. This CIE specification value 26 has been determined based on the standard for the chromaticity diagram called CIE1976($L^*a^*b^*$)/CIELAB that has been developed by CIE (Commission International d'Eclairage), wherein L^* is the component which shows the lightness (luminance); a^* is the component which shows the hue in the range of red to green; b^* is the component which shows the hue in the range of blue to yellow (it is based on the opponent-colors theory).

In the above way, the color is indicated as numeric data based on the predetermined standard, so that it can be controlled or managed as unified color data to reduce differences between apparatus or computers. Specifically, if the computers 3 and 50 manage color as numeric data based on the same standard, the printer 60 connected to the computer 50 can print substantially the same color as that selected on the computer 3. Such the standard of color is not limited to the above standard.

Changing the coloring pattern is performed as follows. To provide the coloring pattern to the whole of the lens area 23, a "WHOLE" key (icon) 27a in a color arrangement item 27 is designated and clicked. To provide the coloring pattern to half (gradation) of the lens area 23, alternatively, a "Half" key (icon) 27b is designated and clicked. In the case of selecting the half pattern, the coloring range can be arbitrarily changed by clicking a coloring range changing key (icon) 27c. The value of the thus changed coloring range appears in a display box 27d.

For example, when the coloring range is changed to 50%, the 50% range from the top within the frame image 22 displayed on the screen is colored in the selected color as shown in Fig. 4.

In the present embodiment, the setting of the location of the half pattern (the coloring range) is made in relation to the top and bottom of the frame image 22. It is therefore necessary to convert the location to distance data from the lens center (the optical center) in order to set the range with respect to the lens 44 to be dyed. This can be made in the following manner.

The size of the face image 21 is determined by a photographing magnification. Accordingly, when photographing is made after the distance between the customer's face and the camera 1 is adjusted in advance to a predetermined distance, the actual size of the face can be found based on the size of the face image 21 displayed on the screen. As shown in Fig. 4, therefore, with a mouse-click while the pointer 15 is positioned in the center 28 of the pupil of the face image 21, the computer 3 can obtain the location of the half pattern (the coloring range) as the actual distance from the pupil center 28. At the time of dyeing of the

lenses 44, the position of the pupil center input as above is converted to the position of the lens center (the optical center) so that the location of the half pattern (the coloring range) can be indicated as distance data from the lens center (the optical center). The distance data appears in a display box 27e.

In the case of the half (gradation) pattern, the range is colored so that the color may gradually fade for the lower part of the range. This fading degree can be selected from among "Large", "Medium", and "Small" in an item 27f. Of course, this fading degree may be arbitrarily set to be continuously variable.

The selection of the lens color may be made to separately color the upper and lower parts of the lens area 23 in different colors. In this case, the apparatus is arranged so that, in addition to the selection of the half pattern, the hue 24 and the lightness 25 of the lower part of the lens area 23 can be set.

In the above manner, the customer can freely select the color and the coloring pattern of a lens while confirming whether the lens color and coloring pattern match his/her face by looking the photographed and displayed face image with the spectacle images on the screen. Upon completion of the selection of the lens color and coloring pattern, a decision key (icon) 29 is clicked to store the picture image of the face wearing the spectacle, the selected color data, and the selected coloring pattern data in the computer 3.

To send an order for the lenses from the optical shop 100 to the lens manufacturer 200, the operator in the shop 100 operates the computer 3 to call a program for order and inputs prescription data including the refractive power of the lens and others. Then,

the computer 3 is operated to on-line transmit the selected and stored color date and coloring pattern data in combination with the prescription data to the computer 50. If the lens dyeing is performed in the dyehouse, the data is further transmitted to the computer 50 installed in the dyehouse via that in the lens manufacturer.

The color data on-line input to the computer 50 is managed as numeric data based on the predetermined standard. The computer 50 decompresses the color data based on the same standard as in the computer 3. Accordingly, the computer 50 can reproduce the same color as that selected in the optical shop 100 (the selection device 10). The location of the half pattern (the coloring range) is managed in the form of numeric data of the distance from the lens center (optical center), so that the computer 50 can decompress the coloring pattern data based on the same standard as in the computer 3 to faithfully reproduce the same coloring pattern. Thus, the computer 50 controls the printer 60 based on the numeric data on the color and the numeric data on the coloring pattern to print a predetermined shape with the sublimatable dye onto the printing base body 61, thereby producing the dye base body 63 to be used for the lens-dyeing.

For example, when the printer 60 is an ink-jet printer (which is, in the present embodiment, a printer "Super Metier" manufactured by INTTC Co., Ltd.), ink cartridges of the printer are filled respectively with sublimatable disperse dye inks (water-base) of red, blue, and yellow. In the present embodiment, for example, each of the dye inks is prepared by mixing the following dye, dispersant, and ion-exchange water in the

prescription below.

Using Dyes

Red: Kayalon Polyester Light Red B-S 200

(made by Nippon Kayaku Co., Ltd.)

Yellow: Kayalon Microester Yellow AQ-LE

(made by Nippon Kayaku Co., Ltd.)

Blue: Dianix Blue AC-E (made by DyStar Japan Ltd.)

Dispersant: Demol MS (made by Kao Corporation)

Prescription (Dye : Dispersant : Ion-exchange water)

Red: 1.0wt% : 0.2wt% : 98.8wt%

Yellow: 3.0wt% : 0.5wt% : 96.5wt%

Blue: 3.0wt% : 0.5wt% : 96.5wt%

To print an intended color on the printing base body 61, regulation (preparation) of the dye inks is numerically controlled by the computer 50. The color thus can be easily produced in response to individual orders. For dyeing of the whole area of a lens, the colored layer 62 is printed in a substantially circular shape on the printing base body 61. For dyeing of the half area of a lens, the colored layer 62 is printed in a substantially circular or semicircular shape on the printing base body 61. On the base body 61, such the colored layers 62 are printed in pairs. This is because the previously printing in pairs is more convenient for dyeing a pair of spectacle lenses; a right and left lenses. The diameter of the colored layer 62 is preferably determined to have a substantial equal to or a slightly larger than that of the lens to be dyed in order to prevent the possibility that the dye may not be fully spread over the whole coloring area of the lens if the diameter of the colored layer

62 is smaller than the lens diameter.

Next, producing of the dye base body of the half (gradation) coloring pattern is explained using a concrete example thereof, referring to Figs. 5A-5D which are schematic views of base bodies produced with the half (gradation) pattern.

A dye base body 63A in Fig. 5A is produced by printing a colored layer 71 in a gradation manner on the printing base body 61. A dye base body 63B in Fig. 5B is produced by printing a colored layer 72 in the form of a substantial semicircle on the printing base body 61 with the constant color density in the entire colored layer 72. A dye base body 63C in Fig. 5C is produced by printing a colored layer 73 so that about two thirds of the layer 73 (a colored layer 73a) is colored in constant density (which is the same as that of the colored layer 72), while the remaining one-third (a colored layer 73b) is colored in a gradation manner. A dye base body 63D in Fig. 5D is produced by printing a colored layer 74 so that two thirds of the layer 74 (a colored layer 74a) is colored in dark density (which is the same as that of the colored layer 72) and the remaining one-third (a colored layer 74b) is colored in light density (which is about half of the dark density). The colored layers 71-74 are made equal in hue. The location of the half pattern (the coloring range) of the colored layers 72-74 are made identical.

According to the present embodiment, by the use of those dye base bodies 63A-63D produced as above, the lenses 44 were dyed in accordance with the above described dyeing method. After dyeing, the transmittance of the lenses 44 were measured. This measurement was carried out using a measurement device; MODEL 304

manufactured by ASAHI SPECTRA CO., LTD. The measurement results are shown in Fig. 6 graphing transmittance transitions by pattern.

In the graph, the horizontal axis indicates the measuring positions, while the vertical axis indicates the transmittance measured at each measuring position. It is to be noted that, it is shown that as the transmittance is lower, the color density of the dyed lens is higher. Four lines A, B, C, and D plot the results of the lenses dyed by the use of the dye base body 63A-63D, respectively. In the above manner, the lenses 44 were dyed with respective gradation patterns by the use of the corresponding dye base bodies 63A-63D. As shown in the graph, for example, with the dye base body 63A, the lens 44 was dyed with a gradation pattern including a small part colored in dark density and then suddenly reducing density. With the dye base bodies 63C and 63D, the lenses 44 were dyed with a gradation pattern including a constant density transition. With the dye base body 63B, the lens 44 was dyed with a gradation pattern including a large part colored in dark density and then suddenly reducing density.

Consequently, if the gradation pattern shown by the line A in Fig. 6 is selected, the dye base body 63A having the colored layer 71 shown in Fig. 5A is produced. If the gradation pattern shown by the line C or D is selected, the dye base body 63C or 63D having the colored layer 73 or 74 shown in Fig. 5C or 5D is produced. If the gradation pattern shown by the line B is selected, the dye base body 63B having the colored layer 72 is produced. Furthermore, if a gradation pattern which is intermediate between the above patterns, similarly, a dye base body having a correspondingly colored layer is produced. Although the

conventional dyeing could not realize the above described various fine gradations, the present invention can achieve the dyeing capable of providing various fine gradations by production of the dye base bodies of various patterns.

5 The dyeing of the lens 44 by means of the dyeing device 40 is performed as follows. The support shaft 41 is first moved up to lift the support plate 42 upward to the upper portion in a housing of the device 40. Then, the dye base body 63 is inserted and attached to the underside of the support plate 42 with tapes
10 or the like so that the colored layers 62 formed on the base body 63 face upward. At the time of attachment, the base body 63 is adjusted to position the two colored layers 62 in a one-to-one correspondence with the two holes 42a of the support plate 42.

 Upon completion of the attachment of the base body 63 to the
15 underside of the support plate 42, the lens holder 43 is set on the upside of the plate 42. The lenses 44 are put in the holder 43 with the concave surface sides facing downward. Subsequently, the heater 45 is heated. In the present embodiment, the heater temperature is set to a predetermined value in a range of
20 100-200°C.

 When the temperature sensor 46 detects that the heater temperature reaches the predetermined value, the dyeing device 40 is airtightly closed and the rotary pump 47 is actuated to produce a vacuum in the device 40. After confirmation of the
25 temperature of the heater 45 having reached the set value, the support shaft 41 is operated to move the support plate 42 down until the plate 42 comes into contact with the heater 45. Thus, the sublimatable dye (the coloring matter) applied on the base

body 63 is sublimated and deposited onto the lenses 44. The lenses 44 are thus colored (dyed).

Upon completion of the heating, the leak valve 48 is opened to return the pressure of the device 40 to normal. Then, the dyeing device 40 is opened to allow the lenses 44 to be taken out. Although the sublimated dye has been deposited on the lenses 44, it is apt to come off if left as it is. To avoid this, the lenses 44 are further heated in an oven not shown under normal pressure to fix the deposited dye on the lens 44. This process is carried out by increasing the temperature of the oven to a set value which is as high as possible below the lens resistible temperature, heating the lenses 44 in the oven for the predetermined duration needed for giving the desired hue and lightness to the lenses 44, and then taking the lenses 44 out of the oven.

In the present embodiment, the dye base body 63 is placed under the lenses 44 at dyeing. Alternatively, the base body 63 may be placed above the lenses 44. In this case, the lenses 44 are arranged with the concave surface sides facing up to face the printed surface of the base body 63. Instead of the heater 45, accordingly, a halogen lamp is used to heat the dye base body 63 from above. In such the arrangement, the edge of the convex surface side of the lens 44 is kept into contact with the lens holder 43. This enables the dyeing of the whole area of the convex surface of the lens 44.

The vapor-phase dyeing method described above needs no large sized equipment required in the dip dyeing method, and also enables the dyeing of lenses by the printer 60 and the dyeing device 40 which are compact in size. Accordingly, the printer 60 and

the dyeing device 40 may be installed in the optical shop 100 to perform the dyeing of lenses in the optical shop 100. In this case, the computer 50 may be omitted, and the printer 60 may be driven if directly connected to the computer 3.

5 The present invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof.

10 For instance, although the water-based ink is used in the above embodiment, the use of oil-based ink can also provide the same effects. In the case of the oil-based ink, a head portion of the ink cartridge is liable to be clogged with the ink when dried. For avoiding such the undesired state, the printing is preferably performed by an ink-jet printer of a piezoelectric type.

15 Regarding the heating way of the dye base body, the dye can be similarly sublimated by the heating of the base body from the side thereof, instead of the heating from above or below as mentioned above.

20 According to the present embodiment of the invention, as mentioned above, the customer can freely select a color and a coloring pattern of the spectacle lenses to be dyed, and the lens manufacturer (or dyehouse) can accurately and easily dye the lenses in correspondence with the selected color and coloring pattern.

25 The foregoing description of the preferred embodiment of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and modifications and

variations are possible in light of the above teachings or may be acquired from practice of the invention. The embodiment selected and described in order to explain the principles of the invention and its practical application to enable one skilled in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the claims appended hereto, and their equivalents.

10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203
2204
2205
2206
2207
2208
2209
2210
2211
2212
2213
2214
2215
2216
2217
2218
2219
2220
2221
2222
2223
2224

WHAT IS CLAIMED IS:

1. A subsystem for producing a dye base body used for dyeing of a spectacle lens, the subsystem including:

a camera for photographing a face of a customer;

5 color memory means for storing a plurality of color data;

color selection means for selecting a desired color data from among the plurality of color data stored in the color memory means;

display control means for controlling a display to display an image of the face of the customer photographed by the camera and coloring a lens area of a displayed spectacle frame image in accordance with the selected color data;

printing means for printing by use of sublimatable dye contained therein; and

print control means for controlling the printing means to print a predetermined shape with the dye on a printing base body in accordance with the selected color data to produce the dye base body.

2. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1 further including:

20 frame memory means for storing a plurality of spectacle frame images; and

frame selection means for selecting a desired spectacle frame image from among the plurality of spectacle frame images stored in the frame memory means;

25 wherein the display control means controls the display to display the image of the face of the customer photographed by the camera while superimposing the selected spectacle frame image on the face image, and to display the lens area of the displayed frame

image while coloring it in accordance with the selected color data.

3. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1 further including:

5 pattern memory means for storing a plurality of coloring pattern data; and

 pattern selection means for selecting a desired coloring pattern data from among the plurality of coloring pattern data;

10 wherein the display control means controls the display to display the lens area of the displayed spectacle frame image while coloring it in accordance with the selected color data and the selected coloring pattern data, and

15 the print control means controls the printing means to print the predetermined shape with the dye on the printing base body in accordance with the selected color data and the selected coloring pattern data to produce the dye base body.

4. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1 further including:

20 a first computer in which the color memory means, the color selection means, and the display control means are provided;

 a second computer in which the print control means is provided; and

25 transmitting means for connecting the first and second computers by a communication line to transmit the selected color data to the print control means.

5. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 4, wherein the color memory means and the print control means manage the color data based on

the same standard.

6. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 4, wherein

the first computer includes prescription input means for
5 inputting prescription data including refractive power of the spectacle lens, and

the second computer includes managing means for managing the selected color data transmitted to the print control means of the second computer in association with the prescription data input
10 by the prescription input means.

7. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1, wherein the predetermined shape to be printed with the dye includes a substantially circular shape having a diameter which is substantially equal to or larger
15 than that of the spectacle lens to be dyed.

8. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 3, wherein the coloring pattern data includes gradation pattern data, and the predetermined shape to be printed with the dye includes at least one of a substantially
20 circular shape or a substantially semicircular shape, each shape having a diameter which is substantially equal to or larger than that of the spectacle lens to be dyed.

9. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 8 further including:

25 optical center input means for inputting data on an optical center of the spectacle lens to be dyed;

wherein the print control means controls the printing means to print the substantially semicircular shape with the dye in

accordance with the optical center data input by the optical center input means.

10. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 9,

5 wherein the optical center input means includes pupil center input means for inputting data on a pupil center based on the face image displayed on the display, and

the print control means controls the printing means to print the substantially semicircular shape with the dye based on the
10 pupil center data input by the pupil center input means, the pupil center data being used as the optical center data.

11. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1, wherein the display control means controls the display to display the plurality of color data
15 stored in the color memory means by separating it into at least hue and lightness, and

the color selection means includes means for individually selecting hue and lightness with reference to the separately displayed hue and lightness.

20 12. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 3, wherein the coloring pattern data includes gradation pattern data, and the pattern selection means includes means for inputting a coloring range as a proportion to the lens area.

25 13. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 12, wherein the pattern selection means includes means for selecting a degree of gradation.

14. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1, wherein the printing base body includes general paper which is available on the market.

5 15. The dye base body producing subsystem for dyeing of the spectacle lens according to claim 1, wherein the printing means includes a general printer of an ink-jet type which is available on the market.

16. A spectacle lens dyeing system including the dye base body producing subsystem for dyeing of the spectacle lens
10 according to claim 1, the dyeing system including

dyeing means for dyeing the spectacle lens by arranging the produced dye base body to face the spectacle lens to be dyed, heating the dye base body under vacuum, thereby sublimating coloring matter in the dye printed on the dye base body to deposit
15 the sublimated dye onto the lens.

ABSTRACT OF THE DISCLOSURE

A subsystem for producing a dye base body used for dyeing a spectacle lens is disclosed. This subsystem includes a camera which photographs the face of a customer, a color memory which stores a plurality of color data, a color selection device for selecting a desired color data from among the plurality of color data stored in the color memory, a display controller for controlling a display to display an image of the customer's face photographed by the camera and coloring a lens area of a displayed spectacle frame image in accordance with the selected color data, a printer for printing using sublimatable dye contained therein, and a print controller for controlling the printer to print a predetermined shape with the dye on a printing base body in accordance with the selected color data to produce the dye base body.

FIG. 1

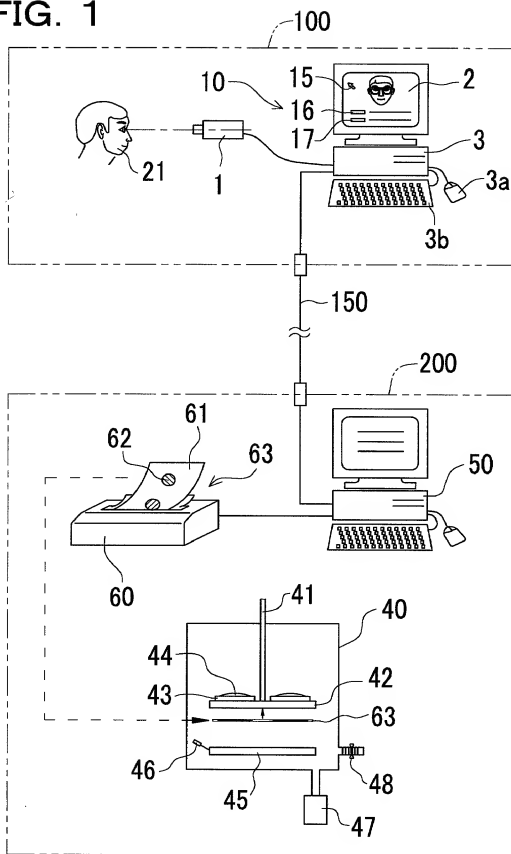


FIG. 2

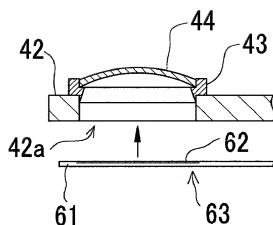


FIG. 3

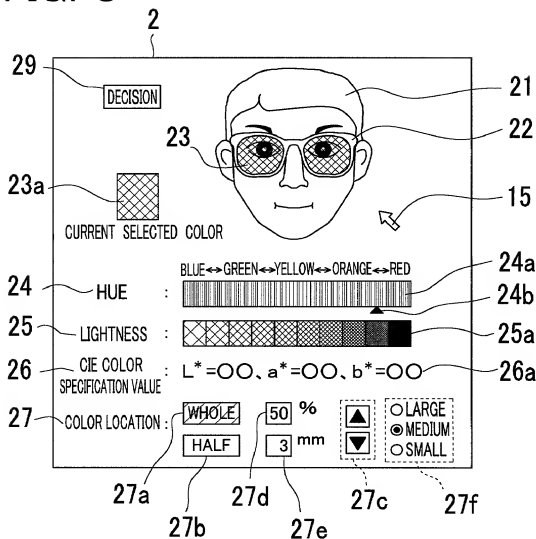


FIG. 4

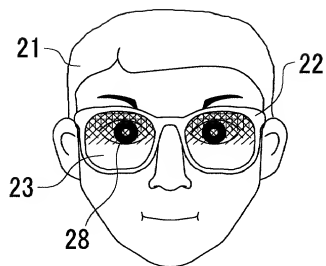


FIG. 5A

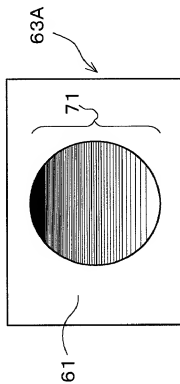


FIG. 5B

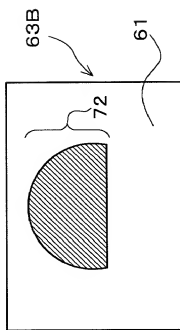


FIG. 5C

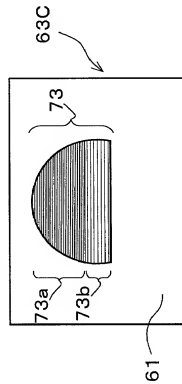


FIG. 5D

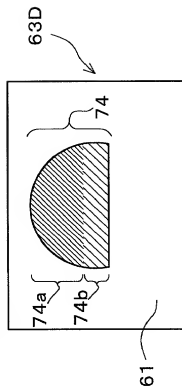
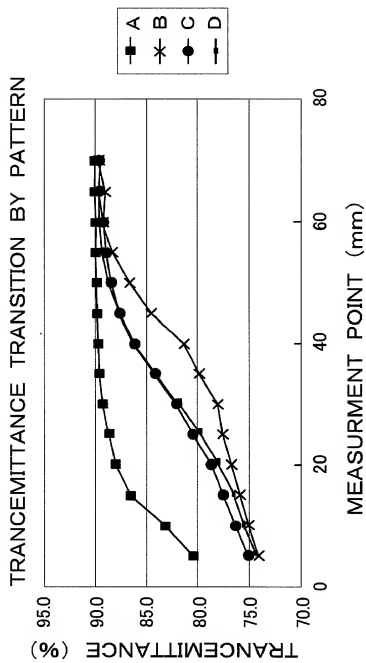


FIG. 6



Declaration and Power of Attorney for Patent Application

特許出願宣言書兼委任状

Japanese Language Declaration

私は、下欄に氏名を記載した発明者として、以下のとおり宣言する：

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、下記名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

A SUBSYSTEM OF PRODUCING DYE BASE BODY USED FOR DYEING OF
SPECTACLE LENSES AND A SPECTACLE LENS DYEING SYSTEM INCLUDING
THE DYE BASE BODY PRODUCING SUBSYSTEM

その明細書を
(該当するものにチェック)
☒ ここに添付する。

the specification of which
(check one)
☒ is attached hereto.

☐ _____年____月____日

☐ was filed on _____ as

出願番号第_____として出願され、

Application Serial No. _____

_____年____月____日補正し、

and was amended on _____
(if applicable)

(該当する場合)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第 37 章第 1 条第 56 項に従い、本願の特許性の有無について重要な情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

私は、合衆国法典第 35 章第 119 条に基づく下記の外国特許出願または発明者証出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願または発明者証出願および/または米国仮出願を以下に明記する：

I hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and/or any U.S. provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign and/or provisional applications
先行外国出願/仮出願

Priority claimed
優先権の主張

11-150821 (Number/番号)	JAPAN (Country/国名)	31/05/1999 (Day/Month/Year Filed/出願年月日)	<input checked="" type="checkbox"/> (Yes/はい)	<input type="checkbox"/> (No/いいえ)
_____ (Number/番号)	_____ (Country/国名)	_____ (Day/Month/Year Filed/出願年月日)	<input type="checkbox"/> (Yes/はい)	<input type="checkbox"/> (No/いいえ)
_____ (Number/番号)	_____ (Country/国名)	_____ (Day/Month/Year Filed/出願年月日)	<input type="checkbox"/> (Yes/はい)	<input type="checkbox"/> (No/いいえ)
_____ (Number/番号)	_____ (Country/国名)	_____ (Day/Month/Year Filed/出願年月日)	<input type="checkbox"/> (Yes/はい)	<input type="checkbox"/> (No/いいえ)
_____ (Number/番号)	_____ (Country/国名)	_____ (Day/Month/Year Filed/出願年月日)	<input type="checkbox"/> (Yes/はい)	<input type="checkbox"/> (No/いいえ)

私は、合衆国法典第 35 章第 120 条に基づき下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第 35 章第 112 条第 1 項に規定の態様で先の合衆国出願に開示されていない限りにおいて、先の出願の出願日と本願の国内出願日または PCT 国際出願日の間に公表された連邦規則法典第 37 章第 1 条第 56 項に記載の所要の情報を開示すべき義務を有することを認める。

I hereby claim the benefit under Title 35, United States code, §120 of any United States application(s) listed below and, in so far as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112. I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial No./出願番号)	_____ (Filing Date/出願日)	_____ (Status: Patented, Pending, abandoned/ 現状: 特許成立、係属中、放棄済み)
_____ (Application Serial No./出願番号)	_____ (Filing Date/出願日)	_____ (Status: Patented, Pending, abandoned/ 現状: 特許成立、係属中、放棄済み)

私は、ここに自己の知識にもとづいて行った陳述がすべて真実であり、自己の所有する情報および信ずるところに従って行った陳述が真実であると信じ、さらに故意に虚偽の陳述等を行った場合、合衆国法典第 18 章第 1001 条により、罰金もしくは禁錮に処せられるか、またはこれらの刑が併科され、またかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損なうことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

委任状：私は下記発明者として、以下の代理人をここに選任し、本願の手続を遂行すること並びにこれに関する一切の行為を特許商標庁に対して行うことを委任する。（代理人氏名および登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

James A. Oliff, Reg. No. 27,075; William P. Berridge, Reg. No. 30,024;
Kirk M. Hudson, Reg. No. 27,562; Thomas J. Pardini, Reg. No. 30,411;
Edward P. Walker, Reg. No. 31,450; Robert A. Miller, Reg. No. 32,771 and
Mario A. Costantino, Reg. No. 33,565

Send Correspondence To/書類送付先:

OLIFF & BERRIDGE
P. O. BOX 19928
ALEXANDRIA, VIRGINIA 22320
USA
Telephone: (703) 836-6400

Direct Telephone Calls To (name and telephone number)/直通電話連絡先(名称および電話番号):

Full name of sole or first inventor/単独または第一発明者の氏名 Kenichi Kamata	
Inventor's signature/発明者の署名 <i>Kenichi Kamata</i>	Date/日付 May 10, 2000
Residence/住所 2-7, Koaza Kitaura, Aza Enmyoji, Oyamazaki-cho, Otokuni-gun, Kyoto, 618-0091 Japan	
Citizenship/国籍 JAPANESE	
Post Office Address/郵便宛先 THE SAME AS ABOVE	
Full name of second joint inventor (if any)/第二共同発明者の氏名(該当する場合) Minoru Inuduka	
Second inventor's signature/第二発明者の署名 <i>Minoru Inuduka</i>	Date/日付 May 10, 2000
Residence/住所 9-3, Aza Banba, Oaza Nishihazu, Hazu-cho, Hazu-gun, Aichi, 444-0703 Japan	
Citizenship/国籍 JAPANESE	
Post Office Address/郵便宛先 THE SAME AS ABOVE	

Supply similar information and signature for third and subsequent joint inventors.

第三又はそれ以降の共同発明者に対しても同様な情報および署名を提供すること。

Full name of third joint inventor (if any)/第三共同発明者の氏名(該当する場合) Tetsuo Yamada	
Third inventor's signature/第三発明者の署名 <i>Tetsuo Yamada</i>	Date/日付 <i>May 10, 2000</i>
Residence/住所 3, Juichiban-cho 1-Chome, Nakagawa-ku, Nagoya-shi, Aichi, 454-0056 Japan	
Citizenship/国籍 JAPANESE	
Post Office Address/郵便宛先 THE SAME AS ABOVE	
Full name of fourth joint inventor (if any)/第四共同発明者の氏名(該当する場合)	
Fourth inventor's signature/第四発明者の署名	Date/日付
Residence/住所	
Citizenship/国籍	
Post Office Address/郵便宛先	
Full name of fifth joint inventor (if any)/第五共同発明者の氏名(該当する場合)	
Fifth inventor's signature/第五発明者の署名	Date/日付
Residence/住所	
Citizenship/国籍	
Post Office Address/郵便宛先	
Full name of sixth joint inventor (if any)/第六共同発明者の氏名(該当する場合)	
Sixth inventor's signature/第六発明者の署名	Date/日付
Residence/住所	
Citizenship/国籍	
Post Office Address/郵便宛先	

Supply similar information and signature for seventh and subsequent joint inventors.
第七又はそれ以降の共同発明者に対しても同様な情報および署名を提供すること。